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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention]This invention can be used for a windowpane etc., sticking it on them as a decoration sheet, and relates to the pressure sensitive adhesive sheet which can do so protective effects, such as prevention of breakage of protection of privacy, glass, etc., prevention of scattering of the fragment, heat insulation, noise control, and vibration proof. This invention relates to the windowpane structure which uses such a pressure sensitive adhesive sheet again.

[0002]

[Description of the Prior Art]Many of conventional protective sheets for windowpanes had adopted the structure of having an adhesive layer as the rear face of the surface substrate which provided the unevenness for an ornament, and a substrate. For example, the protective sheet that the unevenness for giving fanciness to a surface substrate is formed in JP,6-9936,U, and the adhesion projection for the air bulging prevention after attachment is further formed in the rear face of the substrate from the binder etc. is indicated. However, it is comparatively small, and in itself, the size of such an adhesion projection is lacking in fanciness, and needs irregularity working for both a substrate and an adhesive layer. Unlike the case of this invention explained in detail below, conditions (elastic modulus etc.) for an adhesion projection to contribute to the breakage prevention of a windowpane, heat insulation, and a vibration control effect are not indicated, either.

[0003]Heat insulation sheets for glass which form a surface substrate from a plastic sheet, have a spacer of the mesh shape united with the sheet, and apply a binder to the tip of the spacer, such as a window, are indicated by JP,7-42456,A. When it sticks on a windowpane etc., this sheet can form the airtight space surrounded by a substrate, a spacer, and glass, and can demonstrate adiabatic efficiency. However, since the spacer used here consists of

comparatively hard resin, it is deficient in the breakage prevention and the vibration control effect of a windowpane. The application process of a binder is difficult.

[0004]On the other hand, the pressure sensitive adhesive sheet etc. in which the layer of a binder itself has unevenness are already known. For example, in JP,1-70848,U, providing the unevenness which has regular shape, such as a meshes-of-a-net pattern, in an adhesive layer in order to raise the adhesion area on the surface of adherend which is not even as for wallpaper etc. is proposed in the adhesive tape which consists of a base material and an adhesive layer. However, in this gazette, it is not indicated at all about a means to provide the pressure sensitive adhesive sheet which has effects, such as breakage of adherends, such as glass, preventing scattering of the fragment of that adherend, heat insulation, and vibration proof.

[0005]The adhesive tape which equips JP,7-126582,A with a base material and the adhesive layer which is provided on a base material and has unevenness of the regular shape and arrangement below a 1-mm pitch on the surface is indicated. Have unevenness of this adhesive tape and a very detailed structure which consists of 20 micrometers or less-high heights and a crevice whose depth is 10 to 90% of the height of heights a binder, It consists of a polyisocyanate compound with a rate of 1 g to n-butyl acrylate acrylic acid copolymer and the copolymer 100g. Since it does not change substantially even after pasting adherend, unevenness of the adhesive layer of this adhesive tape can be recognized visually as a character, a number, a figure, a sign, etc. through a transparent base material. However, only a means to form the above, comparatively small unevenness is indicated by this gazette, and it is not indicated about means (elastic modulus etc.) to demonstrate an effect to the breakage prevention of adherend, heat insulation, vibration proof, etc. and to maintain even after pasting up comparatively big unevenness.

[0006]The article which has an adhesive layer which has a structural surface which has the micro unevenness which can be formed between adherends for the space which can be estimated if it has the capacity of abbreviation $1 \times 10^3 \text{ mm}^3$ in the International Patent Publication (WO) of/[95th] No. 11945 gazette is indicated. The adhesive layer of this article is formed by ultraviolet-rays polymerization by making the isooctyl acrylate of 90 copies, the acrylic acid of ten copies, and comparatively little cross linking agents (1,6-hexanediol diacrylate of 0.1 copy) into a raw material monomer. The tape which has an adhesive layer which has the same micro structural surface as the above in the International Patent Publication (WO) of/[95th] No. 11655 gazette is indicated. If a technique given in these gazettes is followed, after sticking an adhesive layer on adherend, the unevenness is maintainable, but it is not indicated about a means by which after adhesion maintains the comparatively big unevenness which demonstrates an effect to breakage prevention, heat insulation, vibration proof, etc. The airtight space formed between adherends is maintained,

and although it is said that it has planned to use it positively, only very small airtight space can be formed.

[0007]

[Problem(s) to be Solved by the Invention] Although a certain amount of effect can be acquired when it is used in the conventional pressure sensitive adhesive sheet which was described above, having stuck on the windowpane, simultaneous achievement of the effect of the effect as a protective sheet for which especially this technical field is asked, i.e., the improvement in fanciness, prevention of scattering of glass breakage and its fragment, heat insulation, noise control, and vibration proof cannot be embodied. In addition to these effects, in the above-mentioned conventional example, the concrete suggestion for giving the protective effect (effect sticks on a windowpane etc. and keep the interior of a room from the ability to be seen from outdoor) of privacy was not made.

[0008] One purpose of this invention is stuck on adherend, without following and needing an adhesion means separately, The space of comparatively big capacity can be formed on that spot between adherend and a sheet, it can pass through the space and can maintain stably by the time, and when the space exists, it is in providing the pressure sensitive adhesive sheet which can do so a series of above-mentioned protective effects.

[0009] Another purpose of this invention is to provide the improved windowpane structure which uses the pressure sensitive adhesive sheet of this invention. He could understand the purpose of others of this invention easily from the following detailed explanation.

[0010]

[Means for Solving the Problem] A base in which this invention has a principal plane of two (i)s which faces in the one field, And in a pressure sensitive adhesive sheet containing two or more heights which consist of adhesive crosslinked polymer arranged on the 1st [of the (ii) aforementioned base] principal plane at pattern state, When said heights measure the elastic modulus G by a dynamic-viscoelasticity-measurement method in frequency of one rad/second, and share mode, The elastic modulus G of the range of $5 \times 10^5 - 4 \times 10^6$ dyn/cm² (at 25 **) and less than 1.0 fall of $\log_{10} G$ are shown (in 25-125 **), A pattern formed of said heights can recognize visually via the base from the 2nd principal plane by which said heights of said base are not arranged, And surface roughness Ra of a portion by which said heights of said 1st principal plane are not arranged uses a sensing pin molding surface relative roughness meter, and it is the sensing pin R (R). When a curvature radius at a tip of an indicator for measurement measures on conditions which are 5 micro and a cutoff value of 0.8 mm, a pressure sensitive adhesive sheet being the range of 0.4-200 micrometers is provided.

[0011] In this pressure sensitive adhesive sheet, a portion by which two or more heights arranged at one principal plane of a base are arranged by a pattern that a crevice of two or more geometry is preferably formed by surrounding, and heights are not arranged constitutes

the bottom of a crevice. The bottom of a crevice has above surface roughness Ra, and surface roughening is carried out to sufficient grade to cause diffusion of light.

[0012]This invention is a windowpane structure and the 1st principal plane by which said heights of said pressure sensitive adhesive sheet have been arranged has pasted it up on the surface of said windowpane, The field of another which is characterized by that a windowpane structure, wherein two or more airtight space which became it independent that it was also in a portion by which the surface of said windowpane, said heights, and said heights of said principal plane are not arranged in that case, respectively is formed comprises the following. Windowpane.

A pressure sensitive adhesive sheet of this invention adhered to at least one surface of this windowpane.

[0013]The windowpane structure by this invention can take various gestalten so that it may explain below, For example, even if a pressure sensitive adhesive sheet of one sheet besides a pressure sensitive adhesive sheet of one sheet and a windowpane of one sheet combining, and being used is made to intervene between windowpanes of two sheets, the 2nd principal plane by which heights of a pressure sensitive adhesive sheet are not arranged may paste the surface of another windowpane. A pressure sensitive adhesive sheet of this invention may be used by two sheets or number of sheets beyond it in a windowpane structure if needed.

[0014]

[Embodiment of the Invention]Hereafter, this invention is explained in detail about the desirable embodiment. Please understand that this invention is not what is limited only to the gestalt explained concretely below.

[Pressure sensitive adhesive sheet] the base in which the pressure sensitive adhesive sheet by this invention has a principal plane of two (i)s which faces as [said] carried out, and (ii) -- it is constituted including two or more heights which consist of adhesive crosslinked polymer arranged at pattern state on the 1st [of this base] principal plane. The pressure sensitive adhesive sheet of this invention is used sticking on the surface of one side of a windowpane, or both, and is suitable for especially giving a protective effect including fanciness, privacy protection, glass breakage, the preventing scattering of the fragment, heat insulation, and vibration proof to a windowpane.

[0015]If the operation is briefly explained for sufficient understanding of the pressure sensitive adhesive sheet of this invention, First, at least 1 individual which consists of adhesive polymer followed at least one principal plane of the base, or it is equipped with discontinuous heights, Since it has the predetermined elastic modulus which the bridge is constructed over adhesive polymer of heights, and adhesive polymer described above, It is possible to only stick on adherends (for example, windowpane etc.), without needing an adhesion means separately,

and to form comparatively big space on that spot between adherend and a sheet. As a result of the above formation of space, the modification and disappearance of space by the plastic deformation (natural flow) and external force of heights are prevented, and the capacity and shape of space can be maintained stably. Namely, since it has sufficient adhesive strength effectively so that elastic deformation is possible when the heights on the principal plane of a base have the above-mentioned predetermined elastic modulus (the value of the storage modulus G, and the grade of change of $\log_{10} G$) and receive external force, It can have simultaneously the preventing scattering of fragments, such as breakage of adherends, such as glass, and damaged glass, heat insulation, and a vibration control effect.

[0016]In the pressure sensitive adhesive sheet of this invention, the elastic modulus G of the heights on the principal plane of the base which constitutes it (measured value at 25 **). By less than 5×10^5 dyn/cm², when it measures by a dynamic-viscoelasticity-measurement method in the frequency of one rad/second, and share mode, after pasting up a pressure sensitive adhesive sheet on the adherend surface, heights pass, plastic flow is carried out by the time, and formation of the space between a sheet and the adherend surface becomes impossible.

On the contrary, if the elastic modulus G exceeds 4×10^6 dyn/cm², the adhesive property of heights will fall. In the gestalt in which the fall of the adhesive property of heights also has a possibility of causing the fall of the vibration control effect expected in this invention, and airtight space is formed between a sheet and the adherend surface, there is a possibility that the airtightness in the interface on heights and the surface of adherend may not be acquired.

[0017]When a pressure sensitive adhesive sheet constitutes the protective construction of a windowpane, the elastic modulus G at 25 ** of heights is the range of $6 \times 10^5 - 2 \times 10^6$ dyn/cm² suitably. When it separates from this range, there is a possibility that glass-breakage prevention and the remarkable improvement in the preventing scattering effect of a glass fragment may not be expectable. If the fall of $\log_{10} G$ in the range of 25-125 ** of heights is 1.0 or it is larger than it, That is, if change in this temperature requirement of $\log_{10} G$ is less than -

1.0, heights will pass in the pasted-up pressure sensitive adhesive sheet, plastic flow will be carried out by the time, and it will become unmaintainable [the space formed between a sheet and adherend]. In $\log_{10} G$'s not falling at all or going up on the contrary, it does not produce such plastic flow. However, when the elastic modulus (namely, $\log_{10} G$) of heights rises, bridge construction of adhesive polymer is insufficient at the time of formation of a pressure sensitive adhesive sheet, and it is possible that bridge construction progresses by temporality, and it passes through advance of bridge construction and it causes the fall of the adhesive strength in the time. Therefore, the rise of $\log_{10} G$ is +1.0 or less suitably.

[0018]In order to form heights so that it may have the above-mentioned predetermined elastic-

modulus characteristic, The adhesive polymer over which the bridge was constructed For example, alkyl (meta) acrylate, It prepares by the polymerization of the monomer component containing ethylene nature unsaturated acid and the cross linking agent monomer which has two or more acrylic groups (meta) in intramolecular, and a thing is [making it be 0.5 to 5% of the weight of a range to the whole monomer component] preferred for the content of the cross linking agent monomer. The details of such acrylic adhesive polymer are mentioned later.

[0019]Since surface roughness Ra of the portion (it may be hereafter called a "crevice") by which the heights on the 1st [of a base] principal plane are not arranged is 0.4-200 micrometers, when the lights equivalent to the portion are scattered about, the surface becomes opaque or translucent and the privacy protection effect is demonstrated. If surface roughness Ra of the bottom of a crevice is too low, lights will not be scattered about, but the privacy protection effect will fall, if surface roughness Ra is too large on the contrary, when the height of heights is comparatively small, the space between adherend and a pressure sensitive adhesive sheet will become small, and a series of protective effects except privacy protection will fall. The range of 0.5-100 micrometers of surface roughness Ra of the bottom of such a viewpoint to a crevice is 0.6-50 micrometers especially suitably. It is in the state after pasting up surface roughness Ra of the crestal plane of heights on a windowpane etc.

combining surface roughness Ra of the above-mentioned crevice, and 0.001-10 micrometers is the range of 0.005-5 micrometers especially suitably. Thereby, the privacy protection effect can also be demonstrated in the pressure sensitive adhesive sheet of this invention, heightening the ornament effect. Namely, when stuck on the surface of transparent adherends, such as a windowpane, in the pressure sensitive adhesive sheet of this invention, from the principal plane (the adherend and field which has not been pasted up) of another side of a base. Or it is so more effective for improving fanciness that the difference of these surface roughness Ra is large since the pattern which is observed from the rear face (field which the pressure sensitive adhesive sheet has not pasted up) of adherend and which is formed from heights and a crevice is recognized as a vignette when adherend is a light transmittance state. Therefore, the difference of surface roughness Ra between heights and a crevice is usually 0.75 or more especially suitably 0.5 or more suitably. "Surface roughness Ra" in this application specification is the value which used the sensing pin surface roughness meter and the sensing pin R measured on the conditions which are 5 micro and a cutoff value of 0.8 mm.

[0020]The difference of surface roughness Ra between above-mentioned heights and crevice can be attained by performing and translucent-izing surface roughening processes, such as mat processing, only on the bottom of a crevice, for example. Mat processing is performed by, for example, giving predetermined surface roughness to the surface of the mold-release characteristic negative mold (it mentions later for details) for producing a pressure sensitive adhesive sheet with a duplication method. At this time, the crestal plane (adhesion side) of the

heights of the reproduced pressure sensitive adhesive sheet may have the same granularity as the bottom of a crevice. After heights paste adherend, the granularity of the crestal plane of the heights changes and the light transmittance of the portion is because it can differ an adhesion front. However, preferably, it is in the state before adhesion and it is good that the difference of the surface roughness between heights and a crevice is the above-mentioned range.

[0021]Where the surface of adherends, such as a windowpane, is pasted, in order to form the airtight space of the predetermined volume sealed on the crevice and the adherend surface on a pressure sensitive adhesive sheet, When said heights have been arranged by a pattern which surrounds the crevice of two or more geometry, the operation which eases vibration and impulse force of the sound wave etc. which were added from the 2nd [of a base] principal plane (adherend and field which has not been pasted up) side before getting across to adherend is raised further. That is, breakage prevention, such as glass, and a vibration control effect are heightened. The work which raises a heat insulation operation also has such airtight space.

[0022]In order to make balance and raise a series of above-mentioned effects, it is preferred to decide the capacity of the airtight space of each crevice which was described above to be the optimal range. That is, the capacity of each crevice surrounded by heights has the preferred range of 1-600-mm³. There is a tendency for heat insulation and a vibration control effect to fall that the capacity of this crevice is less than 1-mm³, and on the contrary, when 600-mm³ is exceeded, there is a possibility that the breakage prevention effect may fall. the capacity of a crevice -- suitable -- 4-300-mm³ -- it is the range of 6-200-mm³ especially suitably.

[0023]In the pressure sensitive adhesive sheet of this invention, when it is the structure united with heights including the adhesive polymer by which the bridge was constructed over the base, breakage prevention, such as glass, and the effect excellent in especially the vibration control effect are demonstrated. This pressure sensitive adhesive sheet can function also as a double-sided pressure sensitive adhesive sheet. In this case, for example, the flexible support of a light transmittance state can be pasted up on the 2nd principal plane of a base, and the pressure sensitive adhesive sheet of an one side adhesive type can be manufactured easily. The light transmittance of the flexible support which supports a pressure sensitive adhesive sheet movably is not less than 60% of usually not less than 80% especially suitably not less than 70% suitably. Polyester resin, acrylic resin, polyolefin resin, VCM/PVC system resin, fluororesin, polycarbonate resin, polyimide resin, etc. can be used for the material of flexible support. The range of the thickness of flexible support is usually 10-200 micrometers. Easily-adhesive processing of corona treatment, priming, etc. may be performed to the interface of the principal plane of a base, and flexible support.

[0024]In the pressure sensitive adhesive sheet of this invention, the pressure sensitive

adhesive sheet which has adhesive heights can be formed in both principal planes which arrange heights also to the 2nd principal plane of a base, and face it, or two pressure sensitive adhesive sheets can be pasted together in piles, and it can also be considered as the pressure sensitive adhesive sheet of layered structure. In the case of the latter, it is also possible to build airtight space in the inside of a pressure sensitive adhesive sheet besides the space between adherend-pressure sensitive adhesive sheets. When it has such composition, vibration proof and the breakage prevention effect can be heightened easily.

[0025]When shown by reference, drawing 1 is a perspective view showing an example of the pressure sensitive adhesive sheet by this invention, and drawing 2 is a sectional view in alignment with line segment II-II of drawing 1. In the case of the example of a graphic display, as shown in drawing 2, it is formed in one from material with same base 1 and heights 2 that constitute the pressure sensitive adhesive sheet 10, and the space 3 is formed in the form surrounded by it between adjacency **** heights. Surface roughening of the portion which constitutes the bottom of the space 3 among the 1st principal plane 11 of the base 1 is carried out, and the 2nd principal plane that counters this is flat. In the example of the graphic display, as shown in drawing 1, the convex part 2 of the base 1 is arranged as a lattice pattern, and it follows, and the rectangular crevice 3 is formed. However, in the effect etc. which are considered as a request, various things can be used for the pattern of the heights 2, and the shape of a crevice (space), respectively so that it may explain below.

[0026]In the case of the pressure sensitive adhesive sheet 10 of a graphic display, the principal plane 11 side which has the heights 2 is made to contact the surface of adherends (not shown), such as a windowpane, and it pastes up. The adhesive crestal plane 21 of the heights 2 of the pressure sensitive adhesive sheet 10 is made to specifically paste adherend. Therefore, as for the result of the space 3 being sealed by adherend, two or more airtight space which became independent with three persons of the side of the heights 2, the 1st principal plane 11 that carries out surface roughening, and the surface of adherend, respectively is formed. Although not illustrated, as described above, the flexible support of a light transmittance state can be pasted up on the 2nd principal plane 12 of the base 1, and it can also be considered as the pressure sensitive adhesive sheet of an one side adhesive type.

[Heights] In the pressure sensitive adhesive sheet of this invention, unless the effect of this invention is spoiled, the pattern of all shape can be used for the heights arranged on the 1st [of a base] principal plane. The sectional shape of the pattern of heights is an approximately rectangle suitably. Processability is good, having an adhesion side of sufficient area, when sectional shape of heights is made into an approximately rectangle. The sectional shape of heights of the rectangle which is 0.5-5 mm, or 0.1-8 mm of raised bottoms is a trapezoid which is 0.5-5 mm especially as for 0.2-3 mm and 0.2-10 mm of lower bases 0.1-10 mm in width

especially preferably.

[Base] A base can be divided roughly and the two following gestalten can be used for it.

(I) heights -- said -- the gestalt which comprises material which contains the adhesive polymer over which the bridge was constructed like, and is formed in [it is desirable and / as heights] one.

(II) The gestalt which is constituted from material which can adhere the heights which specifically consist of adhesive polymer over which the bridge was constructed, for example, a plastic film, a ceramic plate, a metallic foil, etc. by different material from heights, and functions also as a base material of heights so to speak from it.

[0027]Although it is in charge of operation of this invention and the gestalt of a gap can also be adopted advantageously, As mentioned above, manufacture of an one side pressure sensitive adhesive sheet is easy, and the gestalt which heightens the fixing force in the interface of heights and a base and by which the heights and the base of the above-mentioned (I) are formed in one from the point which the relaxation effect (effects, such as vibration proof and breakage prevention) of comparatively strong impulse force can improve is preferred.

[0028]The thickness of a base is 0.05-3 mm usually 0.2-0.7 mm especially suitably 0.1-1 mm suitably. When the gestalt which there is a tendency for the relaxation effect of impulse force to fall, and forms airtight space after laminating a pressure sensitive adhesive sheet on adherend when a base is too thin is adopted, there is a possibility that the maintenance performance of airtight space may fall. If too thick on the contrary, a pressure sensitive adhesive sheet will become bulky and the ease of dealing with it and the appearance at the time of being stuck will be spoiled.

[The crevice which is surrounded by crevice] heights and formed in them is indispensable in order to form space (it is called "airtight space" or the exterior, and the "open space" that was open for free passage in this application specification) between a pressure sensitive adhesive sheet and adherend and to demonstrate a series of above-mentioned effects. The principal plane which can arrange in various forms, for example, should form the crevice of a base is an abbreviated flat face, and a crevice can be arranged so that a regular geometrical pattern may be formed almost over the whole surface of the flat face. Otherwise, a crevice can also be arranged so that the pattern formed from heights and a crevice may be recognized as vignettes (comparatively complicated character, figure, etc.). It is preferred that the height of heights is almost uniform in both cases. Thereby, the adhesive strength to adherend can be heightened effectively.

[0029]As the above-mentioned geometrical pattern, a pattern, like being the shape of a lattice pattern and it is alternate (the shape of a checker) is employable, for example. the arrangement number of the crevice per unit area -- usually -- 0.3-50-piece [$/\text{cm}^2$] -- it is 0.5-25-piece [$/\text{cm}^2$] suitably. if there is a possibility that the breakage prevention of adherend,

heat insulation, and a vibration control effect may fall if there are too few crevices and it is too large on the contrary -- substantial -- the capacity of the space between adherend-pressure sensitive adhesive sheets -- a prescribed range -- small -- not carrying out -- it does not obtain but there is a possibility that the above-mentioned vibration control effect etc. may not be acquired, after all.

[0030]the depth (namely, height of heights) of a crevice -- usually -- it is 0.7-2 mm especially suitably 0.6-5 mm suitably 0.5-10 mm. When this depth is too small, there is a possibility that the above-mentioned vibration control effect etc. may fall, and even if too large on the contrary, there is a possibility that vibration proof and the breakage prevention effect of adherend may fall. Various shape can be used for a crevice. For example, they are geometric solids, such as a pillar, a square pillar, a pyramid, a cone, a truncated pyramid, a truncated cone, *****, and *****. The compound shape which consists of one sort chosen from the group which consists of such shape, or two sorts or more can be used for airtight space.

[adhesive polymer] The above mentioned heights are formed from the polymer which has adhesiveness preferably and over which the bridge was constructed. The heights formed from such specific polymer act so that a pressure sensitive adhesive sheet may be certainly pasted up on the adherend surface. When forming airtight space between adherend-pressure sensitive adhesive sheets, it excels in the effect of maintaining airtight space. When airtight space changes or disappears, the air of the inside has a crevice in the adhesion interface on (a) heights and the surface of adherend, and when leaking and coming out from there, (b) heights are penetrated, and it may escape outside and may come out to it. Adhesive crosslinked polymer acts so that may excel in an adhesive property, and the shape maintenance performance of heights may be improved, the cover nature (impermeability) of air may be raised, namely, airtightness may be improved. The elastic-modulus characteristic controlled by the above-mentioned prescribed range gives moderate cohesive force to heights, and it acts also so that the cover nature of air may be improved.

[0031]In one suitable gestalt, adhesive crosslinked polymer is the bridge construction acrylic polymer generated by the polymerization of the monomer component which becomes substantial from alkyl (meta) acrylate, ethylene nature unsaturated acid, and the cross linking agent monomer that has two or more acrylic groups (meta) in intramolecular. Especially bridge construction acrylic polymer is excellent in airtightness. Such airtightness is improved especially when the content of the above-mentioned cross linking agent monomer is 0.5 to 5% of the weight of a range to the whole monomer component. When there is a tendency for air cover nature and shape maintenance nature to fall [the content of a cross linking agent monomer] at less than 0.5 % of the weight and it exceeds 5 % of the weight on the contrary, there is a tendency for an adhesive property to fall. From such a viewpoint, especially the range of the suitable content of a cross linking agent monomer is 0.7 to 2 % of the weight.

[0032]As alkyl (meta) acrylate, i.e., alkyl acrylate, or alkyl methacrylate, isoocetyl acrylate is preferred because of formation of adhesive polymer. It is because isoocetyl acrylate gives adhesiveness to the adhesion side of heights effectively and sticking operation of a pressure sensitive adhesive sheet is made easy. As other alkyl (meta) acrylate, An alkyl group Methyl, ethyl, isopropyl, butyl, isobutyl, Isooctyl, 2-methylbutyl, 2-ethylhexyl, lauryl, Stearyl, cyclohexyl, isobornyl, 2-hydroxyethyl, 2-hydroxypropyl, 3-chloro-2-hydroxypropyl, hydroxyethoxyethyl, Two or more sorts of mixtures chosen from one sort or these of methoxy ethyl, ethoxyethyl, dimethylaminoethyl, a diethylaminoethyl and the alkyl acrylate that is any one of glycidyl, or alkyl methacrylate can be used.

[0033]Acrylic acid (meta), i.e., acrylic acid, or methacrylic acid is preferred for ethylene nature unsaturated acid. (Meta) It is because acrylic acid heightens the cohesive force of adhesive polymer effectively, and raises the shape maintenance nature of heights and the airtightness of airtight space is improved effectively. As other ethylene nature unsaturated acid, two or more sorts of mixtures chosen from one sort or these of beta-hydroxyethyl carboxylic acid, itaconic acid, maleic acid, and boletic acid can be used.

[0034]The blending ratio of alkyl (meta) acrylate (A) and ethylene nature unsaturated acid (E) is suitably chosen so that the elastic modulus of heights may become a predetermined range, but the ranges of it are A:E=80:20 - 99:1 suitably. As a cross linking agent monomer which has two or more acrylic groups (meta) in intramolecular, 1,6-hexanediol diacrylate is preferred. 1,6-hexanediol diacrylate can raise the crosslinking density of adhesive polymer effectively, and can raise an adhesive property, the shape maintenance nature of space, and air cover nature with sufficient balance.

[0035]It can be obtained by polymerizing adhesive crosslinked polymer by heating or the exposure of radiation, such as ultraviolet rays and an electron beam, by using the monomer component containing each above-mentioned ingredient as a starting material. For example, contacting a monomer component in the mold which has a predetermined geometrical structure so that it may mention later, a polymerization and bridge construction are made to complete by a draw spike, and a pressure sensitive adhesive sheet is formed. In this case, that polymerization and bridge construction can be made to complete, polymerizing beforehand selectively the ingredient containing the monomer component which does not contain a cross linking agent monomer, preparing the partial polymerization syrup by which viscosity regulation was carried out, and contacting the mixture of this syrup and a cross linking agent monomer in a mold. In this case, the viscosity of syrup is usually 100-100,000 cps. A polymerization initiator can be used in order to polymerize efficiently. Such a polymerization initiator is a benzophenone series photoinitiator (for example, "IRGACURE 651TM" by ****- Guy Gee) etc., for example.

[0036]As adhesive polymer, polymer, such as rubber system polymer, such as silicone rubber,

isobutylene isoprene rubber, and styrene system rubber, and polyurethane besides the above-mentioned acrylic polymer, can also be used.

[Peel strength when exfoliating from the adherend surface] As for the peel strength at 25 ** when exfoliating from the adherend surface of the pressure sensitive adhesive sheet which heights pasted up on adherend, it is preferred 200-the range of 2,500g/25 mm, and that it is the range of 350-2,000g/25 mm especially. When there is a possibility that effects, such as vibration proof, may fall that this peel strength is less than 200g/25 mm and it exceeds 2,500g/25 mm on the contrary, It originates in it becoming difficult to remove the pressure sensitive adhesive sheet immediately after sticking, and sticking-positions doubling becoming difficult etc., and workability falls.

[0037]When using the pressure sensitive adhesive sheet of this invention as a pressure sensitive adhesive sheet for windowpane protection, after removing a pressure sensitive adhesive sheet in use from glass and cleaning a windowpane, it is advantageous if it can stick again. From such a viewpoint, especially suitable peel strength is less than 1,000g/25 mm. Adjustment of the quantity of a cross linking agent monomer can perform control of peel strength, for example.

[Manufacture of a pressure sensitive adhesive sheet] In the suitable embodiment of this invention, a pressure sensitive adhesive sheet can be manufactured with the following duplication methods.

[0038]The monomer component which contains isoocetyl acrylate and acrylic acid at a predetermined rate, and a polymerization initiator are put in in agitating equipment, and an ultraviolet-rays polymerization is performed, stirring. In this stage, stop to a partial polymerization, it is made to become a range in which that viscosity is 100-100,000 cps, and partial polymerization syrup is prepared. In this syrup, the cross linking agent monomer of the specified quantity and an additional photoinitiator are added, in it, it mixes so that they may become uniform, and in it, the material composition of a pressure sensitive adhesive sheet is prepared. In the case of a polymerization, the inside of agitating equipment is usually purged with inactive gas, such as nitrogen gas.

[0039]On the other hand, the mold for pressure sensitive adhesive sheet shaping which has a predetermined geometrical structure (unevenness) is prepared as follows. First, the positive type which has a predetermined geometrical structure and which consists of a comparatively hard plastic is prepared. An acrylic resin, polycarbonate resin, etc. can be used as a plastic. It exfoliates from a positive type and let what contacted detachability resin to this positive type, and carried out ultraviolet curing of the detachability resin to it be a negative mold. The "AKURI (name of article) Sunday board" series by an AKURI Sunday company can be mentioned as the example of such a positive type, and "type (name of article) **** silicon SE9555" by Toray Industries Dow Corning can be mentioned as the example of detachability resin.

Predetermined granularity is given to the crestal plane of the heights of a negative mold at this time. It is to make the bottom of the crevice of a pressure sensitive adhesive sheet transfer this granularity, and for the bottom of a crevice to have predetermined light transmittance. In order to give predetermined granularity to the crestal plane of the heights of the above-mentioned negative mold, the method of giving granularity to the bottom section of the crevice of the above-mentioned positive type is employable by surface polish means, such as sandblasting. After carrying out surface roughening of the surface of a negative mold, the negative mold which coated and formed fluoro-resins, such as for example, TeflonTM, in the surface can also be used. The range of the surface roughness of the crestal plane of the heights of a negative mold is usually 0.4-200 micrometers.

[0040] Subsequently, the material composition of the above-mentioned pressure sensitive adhesive sheet is contacted to the formed negative mold, and it covers with a transparent release film from a constituent. At this time, a polymerization and when carrying out crosslinking reaction (namely, hardening reaction), a negative mold and a release film are detached with a prescribed interval, and a constituent is arranged so that the portion used as the portion used as the base of a pressure sensitive adhesive sheet and heights may be formed. In this state, it irradiates with ultraviolet rays from on a release film, a hardening reaction is completed, and a negative mold and a release film are removed. The pressure sensitive adhesive sheet which consists of a hardened material of a constituent is obtained.

[0041] In order that a release film may intercept oxygen, it is used, but it also has an effect which fabricates evenly the principal plane of another side of the base of a pressure sensitive adhesive sheet. It can replace with such a release film and the flexible support which adheres to the above-mentioned base can also be used. Usually, flexible plastic films, such as polyester (PET), are used for a release film.

[0042] The following methods are employable in order to determine the thickness of a base. Namely, slush an excessive amount of material compositions on a negative mold, and an it top is covered with a release film (or flexible support), After forming a constituent content layered product, pass the above-mentioned layered product for the inside of the gap of the knife coating machine which has the gap fixed to prescribed distance, a part for the excess of a material composition is made to discharge from the edge of the above-mentioned layered product, and the thickness and display flatness of a portion used as a base are adjusted.

[0043] When using ultraviolet rays as mentioned above, the wavelength of ultraviolet rays is 300-400 nm, and irradiation intensity is usually the range of 330 - 1,000 J/cm². With the engraving which used the sanding method for the flat face of the glass plate as an exception method using the glass plate of sufficient thickness for the material of a positive type, predetermined unevenness can be formed and a positive type can also be formed. What

carried out fluoro-resin processing of the die surface of metal metallic molds using TeflonTM etc. can also be used as a negative mold.

[0044]On the other hand, a base and heights can be formed with a material different, respectively, and can also be pasted up mutually. For example, as a base, mat processing of one principal plane is carried out, and the whole provides heights in the mat processed surface using the above negative molds and the monomer component which gives adhesive polymer after a polymerization using the film formed into diffusion translucent. That is, in the above-mentioned method, instead of a release film, the above-mentioned mat processed film is used and a pressure sensitive adhesive sheet is formed. In this case, in the portion (namely, portion of heights) which adhesive polymer of the base pasted up, it will almost be in a transparent state. Since how (that is, heights are set up so that a crevice may be surrounded) depending on which heights connect in this case heightens the adhesive strength of heights and a base, it is preferred.

[Other additive agents] The pressure sensitive adhesive sheet of this invention may contain various kinds of additive agents used in a pressure sensitive adhesive in ordinary use, unless the effect of this invention is spoiled. A tackifier, a plasticizer, ultraviolet absorption material, an antioxidant, a coloring matter, a filler, etc. are among the additive agents which can be used here, for example.

[Windowpane structure] The pressure sensitive adhesive sheet of this invention can be used, and the windowpane structure for protecting a windowpane can be formed. The windowpane of this invention can be manufactured as follows, for example, if it can provide with various gestalten and the example is shown.

[0045]A pressure sensitive adhesive sheet is arranged so that the crestal plane (adhesion side) of heights and the surface (adherend surface) of the windowpane which is adherend may touch, and you make it lightly stuck by pressure with a hand, the roller for sticking by pressure, etc. from the non adhesion side side of a pressure sensitive adhesive sheet, and an adhesion side is pasted up on the adherend surface. Since heights contain adhesive polymer, a pressure sensitive adhesive sheet can be pasted up on the adherend surface by light sticking-by-pressure operation like [in the case of the usual pressure-sensitive adhesion sheet]. The pasted-up pressure sensitive adhesive sheet forms the independent airtight space of the plurality sealed between a crevice and the adherend surface. In this case, the elastic-modulus characteristic of heights is a predetermined range, and supporting so that airtight space may not collapse in fixed pneumatic pressure can raise jointly the operation which maintains the shape and capacity of airtight space. Sticking-by-pressure operation can be performed by the pressure which is a grade in which airtight space does not collapse only in sticking operation, for example, the range of less than 10 kPa.

[0046]Drawing 3 is a sectional view of the windowpane structure manufactured as mentioned

above. The pressure sensitive adhesive sheet 10 of this invention has pasted up the crestal plane 21 of the heights 2 on one side of the windowpane 31 as a plane of composition so that it may be illustrated. Between the windowpane 31 and the pressure sensitive adhesive sheet 10, the airtight space of the comparatively big capacity originating in the space 3 was formed, and it has contributed to achievement of an expected effect which was described above. namely, -- in this windowpane structure, the effect of improvement in fanciness, prevention of scattering of glass breakage and its fragment, heat insulation, noise control, and vibration proof can be brought about simultaneously -- further -- in addition, the protective effect of privacy can be acquired.

[0047]As one modification of the windowpane structure of a graphic display, as shown in drawing 4, a double windowpane structure can also be manufactured. The pressure sensitive adhesive sheet 10 of this invention is sandwiched with the windowpanes 31 and 32 of two sheets so that it may be illustrated. In such a double windowpane structure, noise control and the remarkable improvement in vibration proof can be attained also especially in it not to mention the effect of a windowpane structure as shown in drawing 2. Although not illustrated, arranging the windowpane structure shown in drawing 4 so that the windowpane 31 may come to the interior-of-a-room side, and sticking the pressure sensitive adhesive sheet of this invention on the windowpane 31 further is recommended to prevent effectively the leakage of the sound from the interior of a room.

[0048]The glass attached in order to be similar to various kinds of articles, a structure, etc. which it "windowpane" Comes to set on this application specifications besides the glass of a window which the word is used in a broad sense and attached for the purpose of lighting etc. with a house, a building, etc. at lighting or it is also included.

[0049]

[Example]Subsequently, this invention is explained about the example.

Production of example 1 pressure sensitive adhesive sheet : The monomer component which consists of isoctyl acrylate 90 weight section and acrylic acid 10 weight section, From the reserve ingredient which consists of IRGACURE 651 TM(made in ****- Guy Gee) 0.1 weight section as a photoinitiator, the partial polymerization syrup by ultraviolet-rays polymerization was prepared. In this syrup, 1,6-hexanediol diacrylate 1 weight section and photoinitiator (IRGACURE 651 TM) 0.2 additional weight section were added as a cross linking agent monomer, in it, it mixed so that they might become uniform, and in it, the material composition of the pressure sensitive adhesive sheet was prepared.

[0050]The thing in which unevenness was formed is used as a positive type so that the crevice of the pressure sensitive adhesive sheet which sculptures a glass plate about 5 mm thick by a sanding method, and is produced may serve as a rectangular parallelepiped which has a predetermined size, and it is the point. Ultraviolet curing was performed by the method

explained by the paragraph of [manufacture of a pressure sensitive adhesive sheet]. The pressure sensitive adhesive sheet (sum total 1.5 mm in height of a 30 cm by 30 cmx base and heights) of this example in which heights are set up so that a crevice may be surrounded on a base was obtained. However, as flexible support, the PET film by Toray Industries, Inc. "lumiler 50TTM" (50 micrometers in thickness, surface roughness Ra0.01micrometer) was used, and after formation of a pressure sensitive adhesive sheet adhered to the base as explained previously in this example without using a release film instead.

[0051]In the obtained pressure sensitive adhesive sheet, the shape of the crevice is a rectangular parallelepiped, and the capacity is 9-mm³ (a 3 mm by 3 mmx depth of 1 mm), and it is arranged at a rate of nine-piece [/cm]² (inside of the level surface, the shape of a lattice pattern). The width which they were set up in the shape of a lattice as heights surrounded the crevice, and was measured by the adhesion side side was 1 mm. Evaluation of a pressure sensitive adhesive sheet: The procedure in which the pressure sensitive adhesive sheet of this example produced as mentioned above was indicated below about the following item estimated. The obtained evaluation result is summarized in the 1st following table, and is shown.

(1) The elastic modulus G of the heights of an elastic-modulus G pressure sensitive adhesive sheet (a storage modulus, dyn/cm²) was measured by the dynamic-viscoelasticity-measurement method in the frequency of one rad/second, and share mode. The dynamic analyzer "part number by [as a measuring device] REOMETO Rix Corp.: RDAll" was used. The sample holding fixture used for this measurement was a parallel plate 7.9 mm in diameter.

(2) Change of fall $\log_{10} G$ of $\log_{10} G$, i.e., a fall, was computed from the variation on the basis of the elastic modulus G at 25 ** read in the viscoelasticity spectrum acquired in 25-125 **.

(3) The capacity of the airtight space formed of a space volume crevice was computed from the capacity of one crevice of the pressure sensitive adhesive sheet before being stuck by the object. For example, when a crevice is the shape which lacks one fields of a geometric solid, such as a truncated pyramid and a rectangular parallelepiped, it can compute from the geometrical dimensions.

(4) The propriety of formation of airtight space estimated shape giving nature shape giving nature. When a pressure sensitive adhesive sheet was stuck on adherend (slide glass is used in this evaluation test), the case where NG and airtight space could form the case where the space (in this case, airtight space) between adherend-pressure sensitive adhesive sheets corresponding to the crevice of a pressure sensitive adhesive sheet cannot be formed was set to O.K. Slide glass is "MICRO SLIDE GLASS (trade name) by a MATSUNAMI glass industry company. It is ***** No.1" and had a size with a 76 mm[in length] x26-mm thickness of 1

mm. [in width]

(5) Shape maintenance nature shape maintenance nature was evaluated from a temporal change of airtight space. After sticking a pressure sensitive adhesive sheet on adherend (the same slide glass as the above is used in this evaluation test), the space immediately after that attachment was compared with the space after after-attachment five-month progress, and the case where O.K. and a clear change were seen in the case where it is almost changeless was set to NG. Such comparison was performed using each 20 times immediately after attachment and after five-month progress as many enlargements (a photograph is taken through slide glass).

(6) The breakage prevention effect (the shock-resistant effect)

The breakage prevention effect was evaluated using the following drop shock testing methods. The thing of one surface of the specimen (the same slide glass as the above) which can be destroyed stuck so that the whole might be covered mostly was made into the sample for the pressure sensitive adhesive sheet. In order to make it the pressure to stick become fixed at this time, the roller for sticking by pressure 2 kg in weight was used, and it was stuck by pressure by making the pressure sensitive adhesive sheet top laid in the specimen go back and forth one time.

[0052]The sample created as mentioned above was laid on the griddle via "FUJI PAPI (trade name)" by towelings and an ocean paper business company so that the attachment side of a pressure sensitive adhesive sheet might become upward, and the with 15 mm in diameter and a mass of 30 g iron ball was dropped from predetermined height. The height which drops the iron ball at the time of an experimental start was 30 cm. When there is no breakage of the specimen which can be destroyed at the drop from a height of 30 cm, It changed into a height of 40 cm and the drop shock test was done similarly, after it, height was changed every 10 cm and it went until the specimen was damaged, and the height in front of [of the height which breakage produced] one was made into the evaluation value (a unit is cm) of a drop shock test. Temperature was 25 ** and relative humidity of test environment was 60%RH.

(7) Peel strength peel strength is the value which measured the exfoliation resistance at the time of exfoliating in a direction the pressure sensitive adhesive sheet stuck on slide glass at the tension speed for 300-mm/180 degrees using a tension tester on condition of the environmental temperature of 25 **, and 60% of relative humidity RH. However, since the pressure sensitive adhesive sheet by this invention is pasted up on slide glass only in respect of adhesion of heights, the measured exfoliation resistance shows the maximum and the minimum. Therefore, the maximum (Max.), the minimum (Min.), and the average value (Av.) that is 1/2 of those sums are shown in a measurement result given in the 1st following table.

(8) About each surface roughness Ra of the bottom of the crevice of a surface roughness pressure sensitive adhesive sheet, and the crestal plane of heights, it is Kosaka Laboratory.

(Kosaka Laboratory Ltd.) The shrine surface roughness meter (SE-30K) was used, and the sensing pin R measured on the conditions which are 5 micro and a cutoff value of 0.8 mm.

(9) It was evaluated whether the privacy protection effect privacy protection effect would actually stick a pressure sensitive adhesive sheet with a plane size of 30x30 cm on the windowpane of a testing laboratory, and could be seen from outdoor. [of an indoor situation] It was presupposed "it is" the case where "nothing" and an indoor situation can hardly be seen in the case where an indoor situation can be seen from outdoor.

The technique of the statement was repeated in said Example 1 except having changed the capacity of the crevice of Example 2 - 4 pressure sensitive adhesive sheets as follows.

[0053]Example 2: 25-mm³ (5 mm by 5 mmx1 mm in height)

Example 3: 80-mm³ (10 mm by 10 mmx0.8 mm in height)

Example 4: 150-mm³ (10 mm by 10 mmx1.5 mm in height)

When evaluation of the pressure sensitive adhesive sheet obtained in each example was performed like said Example 1, the result as shown in the 1st next table was obtained.

[0054]

1st table example 1 example 2 example 3 example 4 cross linking agent (weight section).1 1 1

1 elastic-modulus G 6.7x10⁵ 6.7x10⁵ 6.7x10⁵ 6.7x10⁵ (dyn/cm²) deltalog₁₀ G 0 0 0 0 space

volume (mm³). 9 25 80 150 shape-giving nature O.K. OK OK OK shape maintenance nature OK OK. The OK OK breakage prevention effect (cm) 90 50. 50 50 peel strength Max. 1000. 880 650 650 (g/25mm). Av. 50 490 280 275 Min. 300 100 90 80 surface-roughness Ra (mu) The bottom of a crevice 4.0 4.2 5.2 Crestal plane of 5.7 heights 0.03 0.03 0.03 0.03 privacy **** * the *** protective effect comparative example 1 -- the technique of a statement in said Example 1. [repeat and] The pressure sensitive adhesive sheet was produced. However, in this example, the even adhesive layer about 1.5 mm thick was formed without giving an irregular pattern on the surface of a pressure sensitive adhesive sheet for comparison.

[0055]When evaluation of the obtained pressure sensitive adhesive sheet was carried out like a statement and carried out to said Example 1, surface roughness Ra of the pressure sensitive adhesive sheet of this example was 0.03micro, and the privacy protection effect was "nothing." the evaluation value of the breakage prevention effect was 30 cm, and 180-degree peel strength was 1150g/25 mm.

Except having changed the capacity of the crevice of example 5 pressure sensitive adhesive sheet into 400-mm³ (20 mm by 20 mmx1 mm in height), the technique of the statement was repeated in said Example 1, and the pressure sensitive adhesive sheet of this example was produced.

About the pressure sensitive adhesive sheet for reference produced by the pressure sensitive

adhesive sheet and said comparative example 1 of this invention produced in the example of an evaluation book and said Examples 1 and 3 of adiabatic efficiency, the adiabatic efficiency of each sheet was evaluated as follows.

[0056]After sticking a sample offering pressure sensitive adhesive sheet so that almost the whole surface of the side of the beaker of capacity 50mL may be covered, 65 ** hot water (30mL) was put in in the beaker, and it was neglected in the room of the room temperature (about 25 **). It passed through the temperature change of the hot water in each beaker, and measured by the time, and the temperature change at the time of using the pressure sensitive adhesive sheet of this invention was compared with it of the pressure sensitive adhesive sheet which has a flat adhesive face for reference. It is the graph of drawing 5 which plotted the obtained result as a relation of a temperature gradient (**) with lapsed time (minute) and the pressure sensitive adhesive sheet for reference.

[0057]When were made to exist in airtight space between the sheet and beaker and after-neglect 50 minutes passed as compared with the pressure sensitive adhesive sheet of the comparative example 1, with the pressure sensitive adhesive sheet of Example 1, the temperature of hot water was able to be maintained at a temperature high [about about 1.6], so that he could understand easily from the graph of drawing 5. In the case of the pressure sensitive adhesive sheet of Example 3, when after-neglect 50 minutes passed, the temperature of hot water was able to be maintained at a temperature high about 2.2 **. In the case of Example 3, it was higher than the case where the adiabatic efficiency (namely, heat insulation effect) is Example 1, but it is because this had space volume larger than Example 1. In the case of the pressure sensitive adhesive sheet of Example 5, the temperature of hot water could be maintained at a temperature high about 2.7 ** when after-neglect 50 minutes pass, and the adiabatic efficiency (heat insulation effect) was still higher than the case of Example 3. In the case of the pressure sensitive adhesive sheet of Example 5, this is because the capacity of the space between a sheet and a beaker was larger than that of Example 3. Except having changed the shape and capacity of the crevice of the example 6 pressure sensitive adhesive sheet as follows, the technique of the statement was repeated in said Example 1, and the pressure sensitive adhesive sheet of this example was produced.

[0058]Shape of a crevice: Approximately right truncated four-sided pyramid (the adhesion side side is broad).

capacity of a crevice: 6-mm³ (one side of the opening of the square by the side of an adhesion side is 3 mm)

When evaluation of the obtained pressure sensitive adhesive sheet was carried out like a statement and carried out to said Example 1, the result as shown in the 2nd following table was obtained.

Examples 7-9 -- the technique of the statement was repeated in said Example 6. However, in

this example, the content of the cross linking agent monomer was changed into a quantity given in the 2nd following table from one weight section. When evaluation of the obtained pressure sensitive adhesive sheet was carried out like a statement and carried out to said Example 1, the result as shown in the 2nd following table was obtained.

[0059]

2nd table example 6 example 7 example 8 example 9 cross linking agent (weight section).1

0.25 0.5 2 elastic-modulus G 6.7×10^5 6.0×10^5 6.1×10^5 1.1×10^6 (dyn/cm^2) deltalog₁₀ G 0 -0.4 -

0.2 +0.1 space volume (mm^3). 6 6 6 6 shape-giving nature OK OK OK. O.K. shape maintenance nature The OK OK OK OK breakage prevention effect (cm) 80 60 70 70 peel strength Max. 450 1600 1000 65 (g/25mm) Av. 350 1000 675 50 Min. 250400 350 35 surface-roughness Ra (mu) The bottom of a crevice 4.2 3.3 4.1 Crestal plane 0.03 of 9.3 heights 0.03 0.03 0.03 privacy **** * the **** protective effect comparative example 2 -- the technique of the statement was repeated in said Example 6. However, in this example, for comparison, only isoctyl acrylate was used as a monomer component, and the cross linking agent monomer did not use it. When evaluation of the obtained pressure sensitive adhesive sheet was carried out like a statement and carried out to said Example 1, the result as shown in the 3rd following table was obtained. In the pressure sensitive adhesive sheet of this example, formation of the space between adherend-pressure sensitive adhesive sheets was impossible. The technique of the statement was repeated in the comparative example 3 aforementioned example 6. However, in this example, the cross linking agent monomer did not use it for comparison. When evaluation of the obtained pressure sensitive adhesive sheet was carried out like a statement and carried out to said Example 1, the result as shown in the 3rd following table was obtained. In the pressure sensitive adhesive sheet of this example, maintenance of the space between adherend-pressure sensitive adhesive sheets was impossible.

[0060]

3rd table comparative example 2 comparative-example 3 cross linking agent (weight section).0

0 elastic-modulus G 3.8×10^5 5.8×10^5 (dyn/cm^2) deltalog₁₀ G-2 -2 space volume (mm^3) -- 6 6

shape-giving nature NG OK shape maintenance nature the NG NG example 10 -- the technique of a statement in said Example 1. , the release film (PET film in which one field is a siliconization side) was used instead of flexible support, and the pressure sensitive adhesive sheet of this example was produced.

The vibration control effect of the pressure sensitive adhesive sheet in which it evaluated : ranked second and the vibration control effect was acquired was evaluated as follows.

[0061]First, two aluminum boards with a 25 mm by 100 mm thickness of 2 mm were prepared, the pressure sensitive adhesive sheet which has an approximately same plane size among these was inserted, and these 3 person of each other was pasted up. Between the

concavo-convex adhesive face of a pressure sensitive adhesive sheet, and one aluminum board, the airtight space formed from two or more crevices existed. Next, the pasted-up aluminum board of two sheets on the other hand (the concavo-convex adhesive face of a pressure sensitive adhesive sheet and the pasted-up aluminum board), the surface (field which the sheet has not pasted up) of the aluminum board of another side after [the surface which the pressure sensitive adhesive sheet of this example has not pasted up] attaching an oscillation detector to the middle position mostly -- the center section was mostly flipped once with a metal stick about 3.5 mm in diameter. Vibration transmitted from the flipped aluminum board to the aluminum board which attached the oscillation detector of one more sheet was detected by the commercial oscillation detector and "the acceleration pickup (name of article)" made from PCB (PIEZOTRONICS).

[0062]From detected vibration, it asked for the attenuation factor h1 using the vibration analysis device by a HYU red puckered company "3562 (lot number) A Dynamic Signal Analyzer." Measurement was performed 3 times and those average value was made into measured value. The measured value of this example was 2.0 as indicated to the 4th following table. An attenuation factor is the value which **(ed) the 1st amplitude with the 2nd amplitude, and it expresses that it is so high that this constant is large, an extinction ratio, i.e., a vibration control effect.

The technique of the statement was repeated to the comparative example 4 aforementioned comparative example 1, however the release film (PET film in which one field is a siliconization side) was used instead of flexible support, and the pressure sensitive adhesive sheet of this example was produced.

[0063]Subsequently, in said Example 10, the vibration control effect of the obtained pressure sensitive adhesive sheet was carried out like a statement, and was evaluated. The measured value of the attenuation factor h1 of this example was 1.7 as indicated to the 4th following table.

The technique of the statement was repeated in said Example 10 except having changed the capacity of the crevice of Example 11 - 14 pressure sensitive adhesive sheets as follows.

[0064]Example 11: 1-mm³ (1 mm by 1 mmx1 mm in height)

Example 12: 4-mm³ (2 mm by 2 mmx1 mm in height)

Example 13: 25-mm³ (5 mm by 5 mmx1 mm in height)

Example 14: 100-mm³ (10 mm by 10 mmx1 mm in height)

attenuation factor h1 ** of vibration transmitted from the base of the pressure sensitive adhesive sheet obtained in each example to the heights side -- said Example 10 -- said -- when it was made like and having been measured, the result as shown in the 4th next table was obtained.

Anisotropy of a vibration control effect: It ranked second and the anisotropy of the vibration control effect of the pressure sensitive adhesive sheet obtained by the pressure sensitive adhesive sheet obtained by this example, said Example 10, and the comparative example 4 was evaluated as follows.

[0065]said Example 10 -- said -- it was made like and the attenuation factor was measured. However, in this example, the oscillation detector was attached to the flat face (field opposite to a concavo-convex adhesive face) of a pressure sensitive adhesive sheet, and the pasted-up aluminum board, the aluminum board of one more sheet was vibrated, and it analyzed about vibration transmitted from the heights of a sheet to the base side. The attenuation factor (in order to distinguish from the attenuation factor h1 of vibration transmitted from a base to the heights side explained previously, it is called "the attenuation factor h2") in each example was larger than the attenuation factor h1. That is, the vibration control effect (h2) kept from telling vibration added to heights to the base side was higher than the vibration control effect (h1) which acts so that vibration added to the base may not be told to the heights side, and it turned out that anisotropy exists in a vibration control effect.

[0066]The pressure sensitive adhesive sheet which has anisotropy in such a vibration control effect can be used as follows, for example. The window of double structure is produced using the pressure sensitive adhesive sheet of this invention which does not contain the above flexible support. That is, the above-mentioned pressure sensitive adhesive sheet is inserted between the windowpanes of two sheets, these 3 person is pasted up, and a double window is produced. Thus, the windowpane of a direction on which heights pasted up the produced double window is arranged to the window part of the room so that it may be located in the outdoor side. It can be prevented effectively that vibration transmitted from the outdoor side, i.e., noise, enters indoors by this. Prevention of scattering of protection of privacy, heat insulation, glass breakage, and a glass fragment can also be performed, and fanciness can also be given. The windowpane of a direction which heights pasted up on the interior-of-a-room side can be arranged and the pressure sensitive adhesive sheet (with flexible support) of this invention produced separately can be stuck on the glass surface which it turned to indoors to prevent the leakage of a sound still more effectively from the interior of a room.

[0067]

The example number of the 4th table Space volume Attenuation factor h1 Attenuation factor h2 (mm^3) comparative example 4 0 1.7 1.7 Example 10 9 2.0 3.5 Example 11 1 1.9 3.0 Example 12 4 2.0 3.5 Example 13.25 2.1 3.6 examples 14100 2.3 So that I may be understood from a result given in the 4th table 4.1 *****, the attenuation factor h1 in Example 10 is 2.0 -- said -- it is larger than 1.7 of the measured value of the pressure sensitive adhesive sheet (adhesive face where both sides are flat) of the comparative example 4 which was made like and measured, and a vibration control effect is heightened by existence of the space (airtight space) between

an aluminum board and a pressure sensitive adhesive sheet. Any sheet of the example of Examples 11-14 had a vibration control effect higher than the case of the comparative example 4 by operation of the space (airtight space) formed between adherends (aluminum board).

[0068]

[Effect of the Invention]As explained above, when it is used according to this invention, having stuck on various kinds of adherends, especially a windowpane, etc., when the effect of improvement in fanciness, breakage of adherend and prevention of scattering of the fragment, heat insulation, noise control, and vibration proof can be brought about simultaneously and it sticks on a windowpane etc., the pressure sensitive adhesive sheet for protection which is excellent also in the protective effect of privacy can be provided. The pressure sensitive adhesive sheet of this invention deserves attention also in that it can stick on adherend easily on the spot, without using an adhesion means separately. According to this invention, the windowpane structure which has such the outstanding characteristic can be provided.

[Translation done.]